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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/656,898	09/05/2003	Alexander Star	612407-2	1540

7590 10/20/2006

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EXAMINER

KUNZER, BRIAN

ART UNIT	PAPER NUMBER
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2814

DATE MAILED: 10/20/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	<b>Application No.</b>	<b>Applicant(s)</b>	
	10/656,898	STAR ET AL.	
	<b>Examiner</b>	<b>Art Unit</b>	
	Brian Kunzer	2814	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

#### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) ☒ Responsive to communication(s) filed on 19 July 2006.
- 2a) ☒ This action is **FINAL**.      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) ☒ Claim(s) 1-12, 19 and 20 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-12, 19 and 20 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 19 July 2006 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

## DETAILED ACTION

### *Drawings*

1. The new corrected drawings filed July 19<sup>th</sup>, 2006 have been received and entered and are in compliance with 37 CFR 1.121(d). Accordingly the objection to the drawings is withdrawn.

### *Claim Rejections - 35 USC § 102*

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

2. Claims 1-8, 11, 19, and 20 are rejected under 35 U.S.C. 102(e) as being clearly anticipated by Dai (USPN 6,528,020).

With respect to claim 1, Dai teaches, from figs. 2 and 6, a nanostructure sensor for sensing a target species, comprising:

at least one molecular nanostructure (20);

at least two conducting elements (23) in electrical communication with the at least one nanostructure (20);

a polymer functionalization layer on the at least one nanostructure. (See column 5, lines 1-16 and lines 42-50 and column 6, lines 5-11 and lines 25-40.)

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With respect to claim 2, Dai teaches, from column 4, lines 23-40, that the nanostructure (20) includes carbon nanotubes.

With respect to claim 3, Dai teaches, from column 4, lines 1-10, that the nanostructure comprises a single-wall carbon nanotube (SWCNT).

With respect to claim 4, Dai teaches the nanostructure sensor wherein the at least two conducting elements (23) comprise metal electrodes. (See column 4, lines 23-40.)

With respect to claim 5, Dai teaches, from fig. 2, the nanostructure sensor wherein the at least two conducting elements (23) are in direct physical contact with the at least one nanostructure (20). (See column 4, lines 23-40.)

With respect to claim 6, Dai teaches the nanostructure sensor wherein the polymer layer is selected to interact with the target species. (See column 5, lines 43-50 and column 6, lines 5-11.)

With respect to claim 7, Dai teaches, from column 2, lines 28-30, the nanostructure sensor wherein the polymer layer on the at least one nanostructure (nanotube) is discontinuous (decorating).

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With respect to claim 8, Dai teaches, from column 2, lines 28-30, the nanostructure wherein the polymer layer comprises more than one material.

With respect to claim 11, Dai teaches, from column 5, lines 5-16, a nanostructure sensor that comprises a gate electrode.

With respect to claim 19, Dai teaches, from figs. 1C and 3B, that the nanostructure (20) includes one or more carbon nanotubes. (See column 4, lines 41-57.)

With respect to claim 20, Dai teaches the nanostructure sensor wherein the polymer functionalization layer comprises a material providing an increase in response of the sensor to at least the target species. (See column 5, lines 43-50 and column 6, lines 5-11.)

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Dai (USPN 6,528,020) as applied to claim 1 above, in view of Buckley (USPN 5,674,752).

With respect to claim 9, Dai teaches all the limitations as stated above.

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Dai does not specifically teach that the target species comprises ammonia – although, ammonia is a well-known target for CNT sensors (see ref. [V], p.237) - and the polymer layer is polyethyleneimine (PEI).

However, Buckley, drawn to polymer-coated fibers for use as a chemical sensor, does teach, from fig. 10, the use of PEI as an ammonia sensor.

Therefore, it would have been obvious to one of ordinary skill in the art, at the time of invention, to have Dai nanostructure sensor device use PEI as the polymer over-layer since this material was known to detect ammonia as disclosed by Buckley, and it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice. In re Leshin, 125 USPQ 416.

4. Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Dai (USPN 6,528,020) as applied to claim 1 above, in view of McGill (USPN 6,320,295).

With respect to claim 10, Dai teaches all the limitations as stated above.

Dai does not specifically teach that the target species comprises hydrogen – although, hydrogen is a well-known target for CNT sensors (see ref. [V], p.237, fig. 14) - and the polymer layer is polyethyleneimine (PEI).

However, McGill, drawn to chemical sensors, does teach, from column 7, lines 15-19, the use of PEI as a hydrogen sensor.

Therefore, it would have been obvious to one of ordinary skill in the art, at the time of invention, to have Dai's nanostructure sensor device use PEI as the polymer over-layer since this

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material was known to detect hydrogen as disclosed by McGill, and it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice. In re Leshin, 125 USPQ 416.

5. Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Dai (USPN 6,528,020) as applied to claim 1 above, in view of Gardner (USPN 5,674,752).

Dai does not specifically teach that the nanostructure sensor further comprises passivation material covering regions in which there is electrical communication between the at least two conduction elements and the at least one nanostructure. Although, Examiner takes the position that such passivation material deposited over metallization lines (electrodes) are conventional.

Gardner, drawn to chemical sensors, teaches, from fig. 1a, the nanostructure sensor further comprising passivation material (14) covering regions in which there is electrical communication between the at least two conduction elements (17) and the at the gas sensing structure (18).

Therefore, it would have been obvious to one of ordinary skill in the art, at the time of invention, to have the device of Dai include a passivation layer covering the electrodes of the chemical sensor as disclosed by Gardner, since this is done in conventional semiconductor technology to protect the metallization lines from being exposed and damaged from environmental conditions. (See column 3, lines 45-65.)

***Pertinent Prior Art***

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. H. Dai's "Carbon Nanotubes: Opportunities and Challenges" provides a background of carbon nanotubes (CNT) and their applications and section 5.2 (p. 235) is especially useful for providing information that was known about CNT chemical sensors at the time of applicant's invention. Also figs. 1-6 of U.S Patent 6,346,189 to Dai discloses carbon nanotubes between two conductors, but does not disclose a polymer on the nanostructure.

### *Response to Arguments*

6. Applicant's arguments with respect to claim 1-12 have been considered but are moot in view of the new ground(s) of rejection. The new grounds of rejection were brought upon by Applicant's amendment.
7. The objection of claims 1, 9, and 10 has been withdrawn in view of the amendments made.

### *Conclusion*

8. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period



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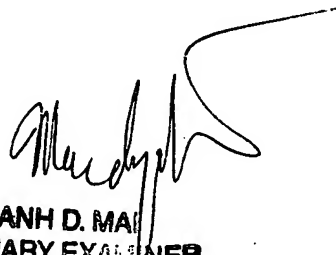
will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Brian Kunzer whose telephone number is (571) 272-5054. The examiner can normally be reached on Monday-Friday 8:00-4:30 EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael Fahmy can be reached on (571) 272-1705. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

BK  
10/5/2006

  
ANH D. MAI  
PRIMARY EXAMINER